



Meteosat Third Generation PROGRAMME STATUS

meteosat third generation

→ SECURING THE FUTURE FOR GLOBAL WEATHER FORECASTING

Meteosat Third Generation: Mission overview

- Imagery mission implemented by a two-satellite MTG-I system:
 - Full disk imagery every 10 minutes in 16 spectral bands
 - Fast imaging of European weather every
 2.5 minutes
 - 3. new Lightning Imager (LI)
- Hyperspectral Infrared (IRS) Sounding mission:
 - 4. 3D mapping of water vapour, temperature, O3 every 1 hour
 - 5. Air quality monitoring and atmospheric chemistry
 - in synergy with Sentinel-4 Ultraviolet Visible
- start of operations in 2019 and 2021
- operational exploitation: 2019–2040

MTG Programme : Planned satellite deployment





MTG Programme – Overall system configuration





MTG Mission: Flexible Combined Imager (FCI)

FCI

- Alternate E to W then W to E scans
- S to N motion between swaths
- Swath width 180km (excluding overlap)
- Repeat time to next swath 10s max at equator
- Reversal of detector order for yaw flip, but not scan pattern.



- 10 min full disc repeat cycle
- SNR 12 to 40
- NEdT 0.1 to 0.3K
- IR3.8 up to 450K
- FDHSI:
- 8 x 1 km channels
- 8 x 2 km channels
- HRFI:



• 2 x 1 km channels





Solar Baffle

MTG Mission: Flexible Combined Imager (FCI)

• Full Disk Scan Service (FCI-FDSS),

- > global scales: Full Disk;
- Repeat Cycle of 10 min, with 16 channels at spatial resolution:
 - \odot 1.0 km for the 8 solar channels;
 - \odot 2.0 km for the 8 thermal channels.
- Rapid Scan Service (FCI-RSS):
 - Iocal scales: 1/4th of Full Disk;

Repeat Cycle of 2.5 min with 4 channels at high spatial resolution:

- o 0.5 km for the 2 solar channels;
- \odot 1.0 km for the 2 thermal channels.



MTG Mission: FCI chain Challenges

- Challenge is the continuation of the MSG service while introducing major improvements:
 - True colour images and permit surpassing current aerosol retrievals especially over land – also an important contribution to air quality monitoring;
 - To provide during daytime total column precipitable water especially over land surfaces;
 - > To improve detection of very thin cirrus clouds;
 - > To improve retrieval of cloud microphysics;
 - The higher spatial resolution (1 km and 2 km) of the 3.8 µm channel will improve fire detection and, via its extended dynamical range (from 350 K to 450 K);
 - To improve the convection detection through the shorter repeat cycle and better spatial resolution.
- Level-1 Instrument Data Processing Facility had its PDR.
- Level-2 Processing Facility Contract Proposal presented to Council
- For the calibration of channels which are not on SEVERI:
 - Cooperation with JMA on Himawari 8 AHI is on going;
 - > Cooperation with NOAA on GOES-R ABI is highly beneficial.



MTG Mission: Lighting Imager

The Lighting Imager Mission measures

Flashes: Cloud-to-Cloud (IC) and Cloud-to-Ground (CG);

> Accumulated Flashes.

Main benefit from GEO: <u>homogeneous</u> and <u>continuous</u> observations delivering information on location and strength of lightning flashes to the users with <u>high timeliness of 30 seconds</u> <u>at ~10km spatial resolution</u>



LIS/OTD flash density in the MTG LI field of view Detect (with a Detection Efficiency of 90% (night) and 40% (overhead sun), monitor, track, and extrapolate in time occurrence of strokes:

- Warnings
- Development (Intensity/Movement) of active convective areas
- Lifecycle of storms

As well as...

- Lightning climatology
- Chemistry (NOx production)



MTG Mission: Lighting Imager Challenges

- New mission without heritage in Europe:
 - coordination with NOAA's GLM mission on GOES-R and GOES-S is essential and has started.
- Filtering of false events:
 - > On board filtering;,
 - > Filtering at Level-1 (IDPF) and Level-2 (L2PF).
- Preparation of the In-orbit Validation is key for the future:
 - The MTG LI measurements of total lightning will complement global measurements of ground based systems (e.g. ATDnet) or future space based system with an overlap of field of view (GLM).



MTG Mission: InfraRed Sounder (IRS)

- MTG-IRS will deliver unprecedented information on horizontal and vertical gradients of moisture, wind and temperature from the geostationary orbit:
 - Full Disk Sounding;
 - Repeat Cycle = 60 min Full Disk coverage; Special Repeat Cycle = 30 min LAC-4 (EUROPE)
 - spatial resolution of 4 km,
 - > hyperspectral soundings at 0.625 cm-1 spectral sampling in two bands:
 - Long-Wave-IR (LWIR: 700 1210 cm-1 ~820 spectral samples)
 - Mid-Wave-IR (MWIR: 1600 2175 cm-1 ~920 spectral samples)





Spatial coverage approach

- A single matrix covers 640x640km² → a two-axis scanning mirror, actuated in step and stare mode, ensures the Earth coverage in 313 steps
- The GEO disk is split in 4 LACs, covered in 15





- Every staring view produces a dwell
- A dwell contains 25600 samples, each one is an interferogram
- All interferograms are sent to ground, where, via L1 processing, they are:
 - transformed into spectra (FFT)
 - radiometrically and spectrally calibrated
 - geolocated



MTG Mission: InfraRed Sounder (IRS) Challenges

- Main challenges of the IRS Products are linked with:
 - Size of product;
 - Needed computation resources;

 \odot Shall be tackled at L1 product.

 Preparation of the procurement of the Level 1 processor via an ITT,

> Target early 2016.



MTG Mission: hosting GMES Sentinel-4



- The GMES Sentinel-4 sounding mission is achieved through the Ultraviolet, Visible & Near-infrared (UVN) Instrument accommodated on the MTG-S satellites
 - covering Europe every hour
 - taking measurements in three spectral bands (UV: 305 - 400 nm; VIS: 400 - 500 nm, NIR: 750 - 775 nm)
 - > with a resolution around 8km.
- The primary data products are O3, NO2, SO2, HCHO and aerosol optical depth.





Overview of the MTG Procurement Status



MTG Programme Status : Next Steps

- 2015: System Implementation Review
 - MTG-I status before the CDR and the Implementation of MTG-S;
- **2016**:
 - > start of the pre-integration of the system using pre-deliveries.
- 2017: MTG-I System Critical Design Review (CDR)
 > Integration of the primary ground segment chains.
- **2018**:
 - > MTG-I System readiness for the launch;
 - > MTG-S System Critical Design Review.
- 2019: MTG-I1 Commissioning
- 2020 : MTG-S System readiness for the launch and commissioning.

